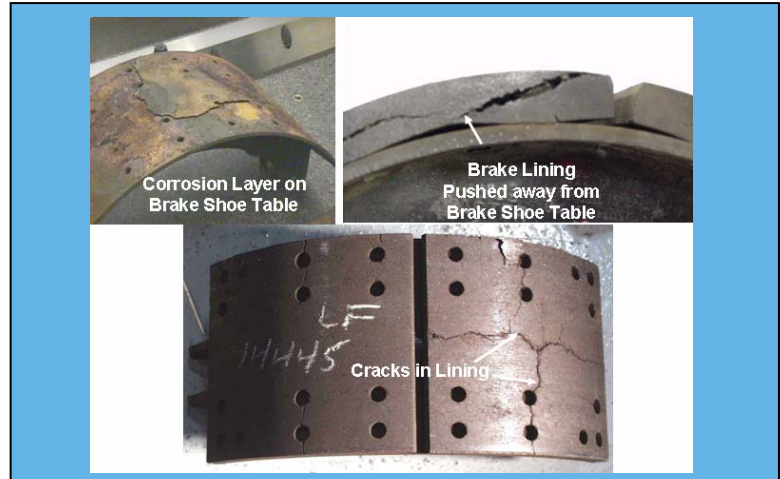


# Effect of Highway Ice-Clearing Treatments On Corrosion of Heavy Vehicle Brakes

## Background

The long-haul trucking industry has been experiencing extensive corrosion of its equipment. While this corrosion affects many parts of the tractor-trailer rig, one of the greatest concerns is that associated with the brakes, specifically, what has been termed “rust jacking.” The mechanism involves the corrosion of the brake shoe table, which results in the buildup of corrosion products between it and the brake lining to which it is riveted. This accumulation of corrosion products causes the brake lining to crack.

In recent years, the frequency of this type of brake failure has doubled coincident with use of increasingly more complex mixtures of anti-icing and de-icing compounds. At present, some combination of solids such as sand, gravel, and coarse salt; liquid solutions of magnesium, calcium, and sodium chlorides; and calcium-magnesium and potassium acetates are employed in various states. Many long-haul trucks, therefore, are exposed to a variety of de-icing and anti-icing compounds in various concentrations, exposure order, and combinations. While brake failure is reported to have increased, it is unclear how the new exposure factors contribute to the failure mode and rate.



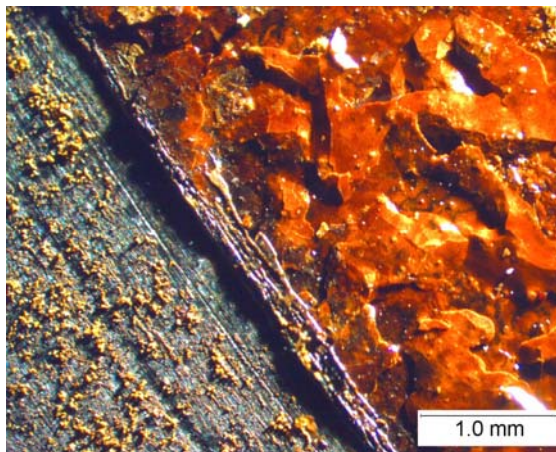
*Brake shoe table and lining showing corrosion product on the table, separation of lining from table and cracking of the lining*

## Benefits

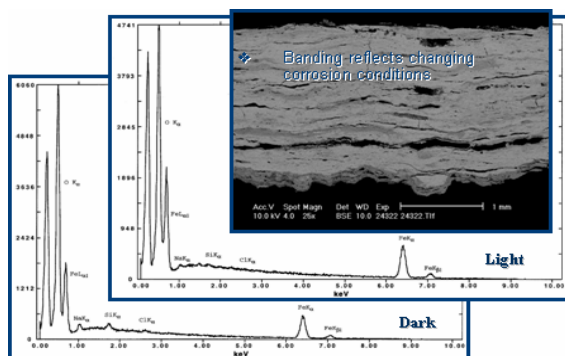
- Increased understanding of the corrosion mechanisms experienced in brake components
- Reduced energy use due to extended brake component use
- Increased durability and reliability of truck brakes leading to increased highway safety

## The Technology

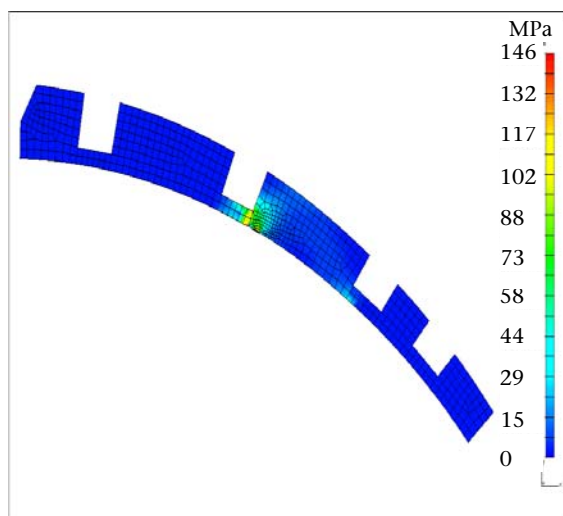
Forensic examination of used brake assemblies, finite element analyses of stresses within the brake lining, laboratory friction tests, and electrochemical tests in various chloride solutions were performed. Results indicate an increased amount of corrosion due to an increased “time of wetness” that results from the presence of hygroscopic salts. A very small amount of corrosion can lead to large stresses in the brake lining, and a temporary decrease in friction due to the formation of a brittle scale.



*Brittle rust layer forms (right) that easily crumbles to fine powder (left)*



*Backscattered electron image revealed light ( $\text{Fe}_3\text{O}_4$ ) and dark ( $\text{Fe}_2\text{O}_3$ ) gray regions of different compositions*



*Stresses in the brake lining with the oxide particle located in the middle of the lining*



## Where Can I Find More Information?

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